



(12) UK Patent Application (19) GB (11) 2 350 541 (13) A

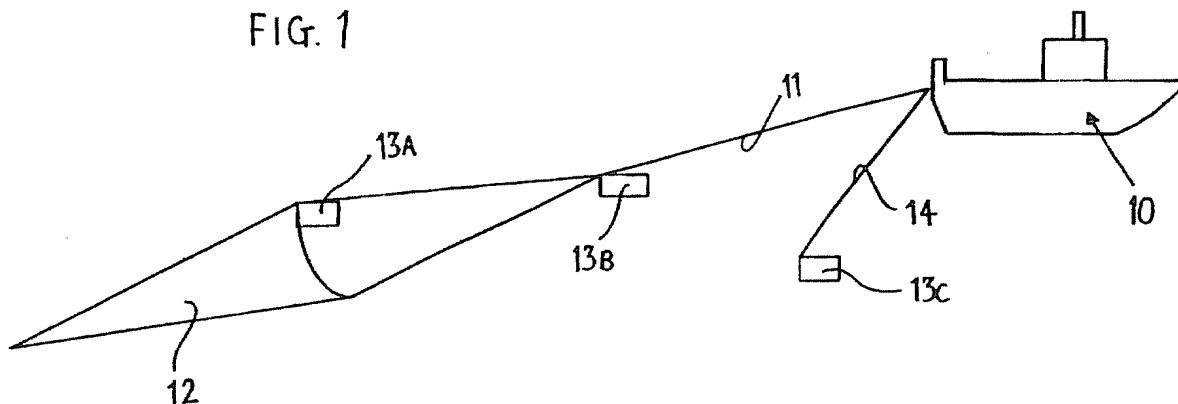
(43) Date of A Publication 06.12.2000

(21) Application No <b>9912642.7</b>	(51) INT CL <sup>7</sup> <b>A01K 79/00</b>
(22) Date of Filing <b>29.05.1999</b>	
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(72) Inventor(s) <b>Hugh Robin Horrex</b>	(56) Documents Cited <b>WO 98/03062 A1 WO 98/03061 A1 JP 063276433 A</b> <b>US 5883858 A US 5291682 A US 5117572 A</b> <b>US 3885338 A</b>
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(54) Abstract Title  
**Trawling method and apparatus using a sound generator**

(57) When trawling, a sound projector 13 is positioned in front of the trawl-net 12 and is so controlled that it generates sounds of such frequencies and/or pulse lengths that they act as a deterrent for fish less than a predetermined size and/or species other than selected species. The sound projector can also transmit sounds to raise fish from the sea bed.

FIG. 1



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FIG. 1

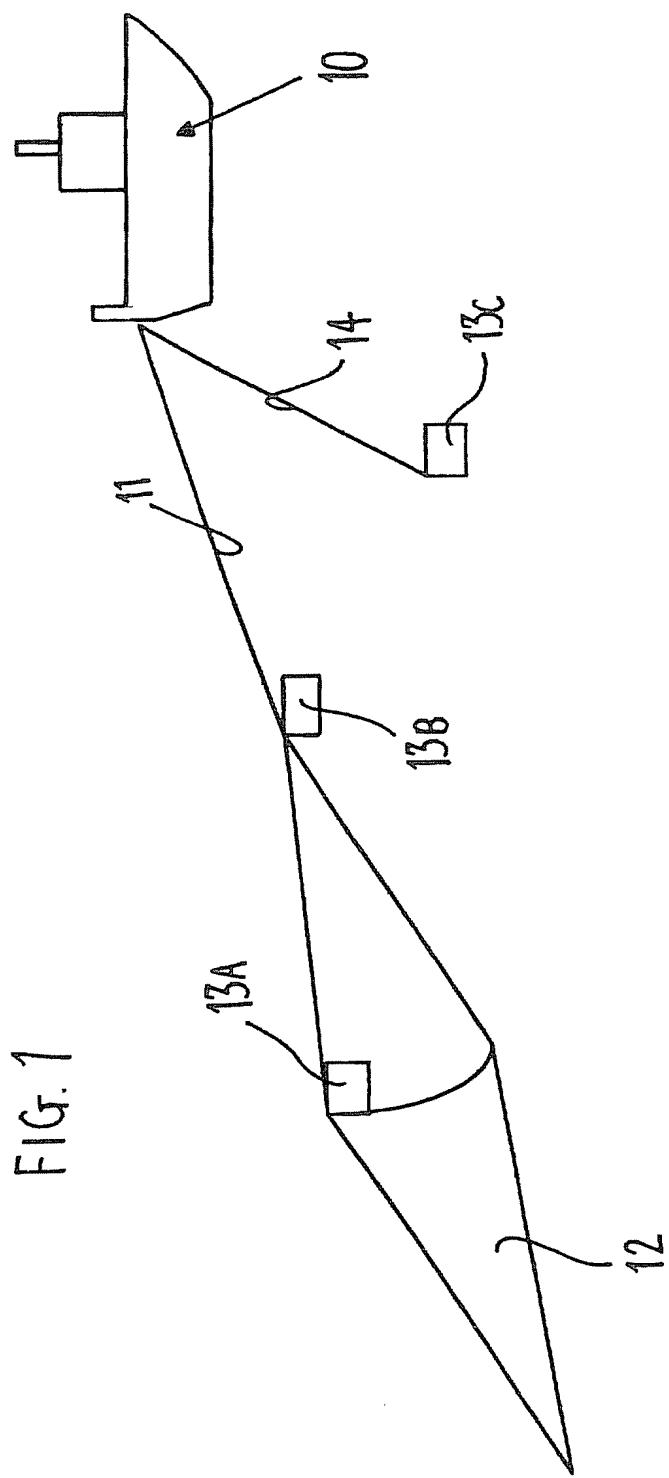
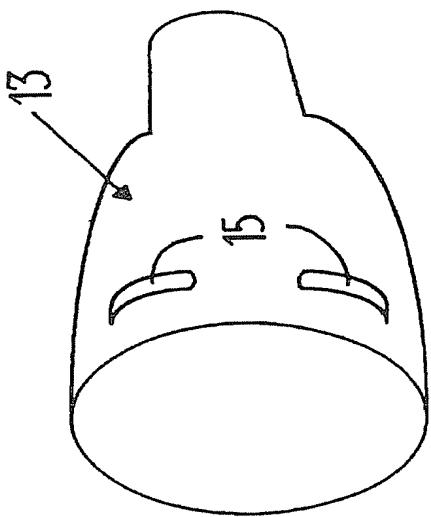


FIG. 2



## TRAWLING

### Field of the Invention

This invention relates to trawling.

Current methods of catching fish by means of trawl-nets have an adverse effect on the overall fish population and are inefficient in that large quantities of small fish are caught and then discarded. Numerous proposals have accordingly been made for regulating the mesh sizes of the trawl-nets but, despite the work that has been carried out in this respect, undersize fish continue to be caught and the problems that this causes get worse.

It is accordingly an object of the present invention to provide a method and means for effectively controlling the size of fish which are caught when trawling.

### Summary of the Invention

According to a first aspect of the present invention there is provided a method of trawling for fish using a trawl-net in which a sound projector is positioned in front of the trawl-net and in which

the sound projector is so controlled that the frequencies and/or the pulse lengths of the sounds which are generated are such that they act as a deterrent to fish less than a predetermined size and/or of species other than selected species.

According to a second aspect of the present invention there is provided operating means for use when trawling for fish using a trawl-net, said operating means comprising a sound projector which, in use, is positioned in front of the trawl-net and control means for controlling operation of the sound projector so that the frequencies and/or the pulse lengths of the sounds which are generated are such that they act as a deterrent to fish less than a predetermined size and/or species other than selected species.

The responses of fish to sounds of different frequencies and/or pulse lengths vary in dependence on the size of the fish and the species of the fish. It is accordingly possible to select the frequencies and/or the pulse lengths of the sounds which are generated such that, although fish of less than a predetermined size and/or species of fish other than selected species will be deterred by the sounds which are being generated in front of the trawl-net, fish above said predetermined size and/or fish of the selected species will not be deterred and will be caught by the trawl-net.

The invention is envisaged as being of particular application to the catching of phallagic species, i.e. round fish such as cod. It is also envisaged, however, that the sound projector could be

caused to generate sounds of such frequencies and/or pulse lengths that they would arouse the attention of flat fish such as plaice, which tend to stay close to the sea-bed, causing the flat fish to rise from the sea-bed making it more likely that such flat fish will be caught in the trawl-net.

According, therefore, to a further aspect of the present invention there is provided a method of, and means for, trawling for fish which tend to stay on the sea-bed, in which a sound projector is used to transmit sounds of such frequencies and/or pulse lengths as to arouse or to attract the attention of such fish causing them to rise up from the sea-bed.

#### **Brief Description of the Drawings**

Figure 1 shows a trawler and three possible positions for location of a sound projector, and

Figure 2 shows a possible design for a sound projector.

#### **Description of the Preferred Embodiment**

As shown in Figure 1, a trawler 10 has a depending line 11 to which a trawl-net 12 is attached so that, as the trawler 10 advances, the open trawl-net 12 will follow the trawler 10 at a known, predetermined depth.

A sound projector 13 is mounted on the trawl line 11 at position 13A so as to hang immediately in front of the trawl-net 12 or at a position 13B in advance of the open mouth of the trawl-net 12. The sound projector 13 can alternatively be attached to a separate line 14 of such length that the sound projector 13 is at a position 13C in front of the open mouth of the trawl-net 12.

The sound projector 13, which can have the configuration shown in Figure 2, may be powered from the trawler 10 or provided with its own power supply. The sound projector 13 is, however, preferably so connected to the trawl line 11 or to the separate line 14 that the vibrations of the trawl line 11 or separate line 14, resulting from travel of the trawler 10 through the water, serve to provide some or all of the power for operation of the sound projector 13. The sound projector 13 has a pair of fixing points 15 to enable it to be attached to the trawl line 11 or the separate line 14 in such manner that the generated sound waves are propagated in the required direction.

The frequencies and/or the pulse lengths of the sounds generated by the sound projector 13 are so controlled, for example, by means of a remote control (not shown) operated from the trawler 10, that the sounds which are generated are such as to have a deterrent effect on fish below a certain size and/or on fish of species other than those which the trawler operator wishes to catch. In use, therefore, adjustment of the output of the sound projector 13 is effected to ensure that only fish above a

predetermined size are caught in the trawl-net and that only the required species of fish are caught.

Species with swimbladders, such as cod and whiting, are moderately sensitive to sound in the sub-3 kHz hearing band, the swimbladder acting to convert the sound pressure waves to vibrations that can be sensed by the inner ear. Species with a reduced swimbladder (e.g. flatfish) or no swimbladder are of low sensitivity to sound. Certain swimbladder species, for example, the herring/sprat family (clupeidae) have couplings between the swimbladder and the inner ear that make them especially sensitive to sound. It is thus possible, when fishing for mackerel (which have no swimbladder) using pelagic gear to drive away other non-target pelagics, such as pilchards.

In addition to transmitting sounds which have a deterrent effect on small fish, the sound projector 13 can also be caused to transmit sounds which will arouse or attract the attention of the "bottom-feeders", i.e. those fish which tend to stay on the sea-bed. Such "bottom-feeders" will thus tend to rise from the sea-bed making it more likely than they will be caught in the trawl-net.

The sound projector 13 can comprise underwater transducers coupled to signal generators and amplification equipment located on the trawler 10. Pneumatic sound sources may alternatively be employed.

It will be appreciated that the present invention will enable trawling to be carried out economically while enabling effective conservation policies to be carried out on a worldwide basis.

Claims:-

1. A method of trawling for fish using a trawl-net in which a sound projector is positioned in front of the trawl-net and in which the sound projector is so controlled that the frequencies and/or the pulse lengths of the sounds which are generated are such that they act as a deterrent to fish less than a predetermined size and/or of species other than selected species.
2. Operating means for use when trawling for fish using a trawl-net, said operating means comprising a sound projector which, in use, is positioned in front of the trawl-net and control means for controlling operation of the sound projector so that the frequencies and/or the pulse lengths of the sounds which are generated are such that they act as a deterrent to fish less than a predetermined size and/or species other than selected species.
3. A method as claimed in Claim 1 or operating means as claimed in Claim 2, in which the sound projected is in the sub-3 kHz hearing band.
4. A method of trawling for fish which tend to stay on the sea-bed, in which a sound generator is used to transmit sounds of such frequencies and/or pulse lengths as to arouse the attention of such fish causing them to rise up from the sea-bed.

5. Means for trawling for fish which tend to stay on the sea-bed, said means including a sound generator which is used to transmit sounds of such frequencies and/or pulse lengths as to arouse the attention of the fish causing them to rise up from the sea-bed.

6. A method of trawling for fish as claimed in Claim 1 and substantially as hereinbefore described with reference to the accompanying drawing.

7. Operating means as claimed in Claim 2 and substantially as hereinbefore described with reference to the accompanying drawing.

8. A method of trawling for fish as claimed in Claim 4 and substantially as hereinbefore described with reference to the accompanying drawing.

9. Means for trawling for fish as claimed in Claim 5 and substantially as hereinbefore described with reference to the accompanying drawing.

**Amendments to the claims have been filed as follows**

1. A method of trawling for fish using a trawl-net having an open mouth, in which a sound projector is positioned in advance of the open mouth of the trawl-net and in which the sound projector is so controlled that the frequencies and/or the pulse lengths of the sounds which are generated are such that they act as a deterrent to fish less than a predetermined size and/or of species other than selected species.
2. A method as claimed in Claim 1, which includes controlling the direction of propagation of the sound waves.
3. Operating means for use when trawling for fish using a trawl-net having an open mouth, said operating means comprising a sound projector, mounting means for mounting the sound projector so that, in use, it is positioned in advance of the open mouth of the trawl-net and control means for controlling operation of the sound projector so that the frequencies and/or the pulse lengths of the sounds which are generated are such that they act as a deterrent to fish less than a predetermined size and/or species other than selected species.
4. A method as claimed in Claim 1 or operating means as claimed in Claim 3, in which the sound projected is in the sub-3 kHz hearing band.

5. Operating means as claimed in Claim 3, in which the sound projector has a pair of fixing points to enable it to be attached to a line in such manner that the generated sound waves are propagated in the required direction.

6. A method of trawling for fish as claimed in Claim 1 and substantially as hereinbefore described with reference to the accompanying drawing.

7. Operating means as claimed in Claim 3 and substantially as hereinbefore described with reference to the accompanying drawing.

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Application No: GB 9912642.7  
Claims searched: 1-9

Examiner: Paul Jenkins  
Date of search: 24 August 1999

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): A1A (A31D, A31G, A31X)

Int Cl (Ed.6): A01K 79/02

Other: Online: WPI, EPODOC, JAPIO

**Documents considered to be relevant:**

Category	Identity of document and relevant passage		Relevant to claims
X	WO 98/03062 A1	(LOUGHBOROUGH) Whole document relevant especially figure 5.	1-3
X	WO 98/03061 A1	(SKIPPER) Whole document relevant	4-5
X	US 5883858	(HOLT) Whole document relevant	1-5
X	US 5291682	(ZACCHEO) Whole document relevant	1-2
X	US 5117572	(PARRA) Whole document relevant	1-2
X	US 3885338	(YORK) Whole document relevant	1-5
X	JP 63276433 A	(KOA RAND) PAJ abstract and figures	4-5

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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